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Monetary policy and asset prices with belief-driven fluctuations

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ABSTRACT

We present a heterogeneous agents New-Keynesian model subject to a cost channel of monetary policy transmission. Constant turnover between long-time traders and newcomers in market activities, combined with restricted trading opportunities, introduces a feedback from the stock market to real activity, making stock prices non-redundant for the business cycle. We show that strict inflation targeting can lead to equilibrium indeterminacy, even if the policy rule satisfies the Taylor principle. A belief-driven shock to stock price generates relative volatilities of key financial variables which are very close to what is observed in U.S. data. This result hints to the possibility that the financial instability witnessed since the mid-to-late 1990s was the result of waves of (rational) exuberance and pessimism in financial markets. Our analysis suggests that a mild response to stock prices in the central bank's policy rule can restore equilibrium determinacy and therefore rule out non-fundamental volatility.

1. Introduction

The global financial crisis of 2007–2009 has highlighted the interaction between financial variables and the aggregate economy. Although how to prevent a new crisis is likely to remain the subject of debates for quite some time, an emerging view calls for placing more emphasis on financial markets and banking in macroeconomic models to better grasp the underlying macro-financial linkages.

Building on the previous contributions, the theoretical literature has identified three main channels accounting for the transmission of financial shocks to the real economy or the amplification of shocks coming from the real economy itself: (1) the borrower's balance sheet channel; (2) the bank lending channel; and (3) the bank liquidity channel.[1]

The first channel is based on the agency costs framework conceived by Bernanke and Gertler (1989) and Carlstrom and Fuerst (1997), and then further developed in the financial accelerator model of Bernanke et al. (1999). According to this view, because of a moral hazard problem due to lenders' imperfect monitoring of firms activities/risks and lack of enforcement in debt repayments, firms must provide a collateral in order to access external finance. By impacting the market value of the collateral, shocks to asset prices affect the tightness of firms' borrowing constraints, and hence real

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[1] The Basel Committee on Banking Supervision (2011) gives an extensive survey of the theoretical and empirical literature on these three channels.

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activity. At the same time, any shock to the real economy that eventually impacts firms' net worth is amplified relative to an economy where these credit frictions are absent. A similar mechanism applies to household borrowing, as financially constrained households pledge their home property to obtain mortgages from lenders. This channel has been successful at capturing the business cycle implications of structural linkages between the housing market and the real economy, as shown in Iacoviello (2005) and Iacoviello and Neri (2010).

The second channel is related to the bank's balance sheet and capital requirements. On the one hand, as financial intermediaries, banks can exacerbate the contractionary effects of a monetary tightening via a reduction in the supply of loans to credit-constrained households and firms. On the other hand, similar to the financial accelerator framework, negative shocks to the bank's own capital are a threat to its solvency and can severely undermine its creditworthiness. To compensate for the resulting higher costs of external finance, the bank is likely to increase interest rates on loans, with a negative impact on economic activity.[2]

The third channel highlights the role of liquidity in banking, with a particular focus on the aggregate consequences of high leverage and maturity mismatches on banks' balance sheets. When banks rely on short-term debt to fund mortgages for the purchase of illiquid assets by households/firms, a negative shock to liquidity can force banks to undertake asset fire sales in order to meet debt obligations. The result is downward pressure on asset prices, which calls for further asset sales, generating a Fisherian deflationary spiral.[3]

Within the New Keynesian Dynamic Stochastic General Equilibrium (NK-DSGE) framework – the current workhorse of monetary policy analysis – the financial accelerator is indeed the most prominent of the three channels described above.[4] However, while it constitutes a plausible description of the transmission/amplification of standard aggregate shocks (such as shocks to total factor productivity and to the policy instrument), the financial accelerator model fails to generate the large asset price volatility observed in the data. Starting with works by Shiller (1981) and LeRoy and Porter (1981), there is in fact no lack of empirical evidence supporting the idea that asset prices are much more volatile than what can be justified by the underlying fundamentals.[5] In particular, both the late 1990s and the years preceding the 2007–2008 financial meltdown have been labeled as clear examples of bubble-driven fluctuations in stock or housing markets.

In a context where central banks are strongly committed to price stability and stable growth, an important unsettled question is then whether they should take deliberate steps to prevent or deflate non-fundamental asset price fluctuations.[6] On the one hand, given the direct impact of asset prices on both inflation and output, some economists have argued that central banks can improve macroeconomic performance by responding directly to movements in asset prices. For instance, based on simulations from a small-scale macroeconomic model, Cecchetti et al. (2000, 2002) argue that the short-term nominal interest rate (the central bank's policy variable) should be increased in response to temporary “bubble shocks”. On the other hand, because of the observational equivalence of fundamental and non-fundamental shocks hitting asset prices, and the fact that both types of shocks ultimately impact on aggregate variables, others have argued that central banks can do just as well by responding exclusively to output and inflation. Bernanke and Gertler (1999, 2001) were among the first to promote this view.[7]

Despite the different conclusions, the models used by Cecchetti et al. (2000, 2002) and Bernanke and Gertler (1999, 2001) share a common drawback: they assume that asset price bubbles are completely exogenous, i.e., bubbles randomly inflate and burst regardless of any policy intervention. Consequently, they cannot address the important question of whether policy-makers should take action to prevent bubbles from forming or to deflate a bubble once it has formed.

Our paper contributes to this literature by investigating the quantitative importance of a non-fundamental shock with the following properties: (1) it is model-consistent and satisfies full rationality; (2) it originates from the stock market via a self-fulfilling belief-driven revision of agents' expectations; and (3) its existence depends on key structural features of the macroeconomy and on the policy rule followed by the central bank. The framework for our analysis is a *heterogeneous agents* NK-DSGE model where the macro-financial linkages arise due to *intertemporally incomplete markets*. In this sense, we highlight an additional channel through which financial shocks can be transmitted to the real economy.

An advantage of our modeling framework with respect to the more common financial accelerator model is its small-scale reduced form. Once linearized around the unique non-stochastic steady state, the equilibrium dynamics are described by four equations: a IS curve, a New-Keynesian Phillips curve, an aggregate stock price equation and a monetary policy rule.

[2] Recent contributions focusing on the introduction of a banking sector in a dynamic macroeconomic model are Curdia and Woodford (2010), within a New-Keynesian framework, and Aliaga-Diaz and Olivero (2010), within a Neo-Classical framework. Airaudo and Olivero (2012) study the monetary policy transmission mechanism in a New-Keynesian model with counter-cyclical spreads, by introducing “deep habits” in lending along the lines of Aliaga-Diaz and Olivero (2010). They show that both shocks to TFP and to the policy rate are amplified by the existence of frictions in banking. Van den Heuvel (2002, 2008) studies instead the monetary policy transmission and the welfare consequences of bank capital requirements.

[3] See Brunnermeier (2009) for a discussion of the liquidity channel in light of the recent financial crisis. Boz and Mendoza (2012) study a model where a collateral constraint on household borrowing combined with learning about new financial products amplifies the Fisherian debt-deflation mechanism.

[4] See, for instance, the recent contributions by Faia and Monacelli (2007), Gertler et al. (2007), Christensen and Dib (2008) and Christiano et al. (2013), among others.

[5] For recent update on this extensive literature, see Lansing and LeRoy (2011).

[6] Jurgilas and Lansing (in press) provide an overview of the various arguments.

[7] Dupor (2005) studies optimal monetary policy in a New-Keynesian model with exuberance shocks to the expected return on physical capital. He finds that there are some benefits from responding to non-fundamental shocks, although they depend on (1) the monetary policy regime (discretion versus commitment), and (2) whether the central bank can distinguish between a productivity-driven and a non-fundamental belief-driven increase in asset prices.